

PATENT COOPERATION TREATY
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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 12 APR 2005

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Applicant's or agent's file reference 123472X307	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. PCT/NZ2004/000070	International filing date (<i>day/month/year</i>) 6 April 2004	Priority date (<i>day/month/year</i>) 8 April 2003
International Patent Classification (IPC) or national classification and IPC Int. Cl. ⁷ G01S 17/36		
Applicant THE UNIVERSITY OF WAIKATO et al		

<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 3 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p style="margin-left: 20px;">a. <input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of 4 sheets, as follows:</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p style="margin-left: 40px;"><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or table related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> <p>4. This report contains indications relating to the following items:</p> <table style="width: 100%; border: none;"><tr><td style="width: 10%;"><input checked="" type="checkbox"/></td><td style="width: 20%;">Box No. I</td><td>Basis of the report</td></tr><tr><td><input type="checkbox"/></td><td>Box No. II</td><td>Priority</td></tr><tr><td><input type="checkbox"/></td><td>Box No. III</td><td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td></tr><tr><td><input type="checkbox"/></td><td>Box No. IV</td><td>Lack of unity of invention</td></tr><tr><td><input checked="" type="checkbox"/></td><td>Box No. V</td><td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td></tr><tr><td><input type="checkbox"/></td><td>Box No. VI</td><td>Certain documents cited</td></tr><tr><td><input type="checkbox"/></td><td>Box No. VII</td><td>Certain defects in the international application</td></tr><tr><td><input type="checkbox"/></td><td>Box No. VIII</td><td>Certain observations on the international application</td></tr></table>	<input checked="" type="checkbox"/>	Box No. I	Basis of the report	<input type="checkbox"/>	Box No. II	Priority	<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	<input type="checkbox"/>	Box No. IV	Lack of unity of invention	<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	<input type="checkbox"/>	Box No. VI	Certain documents cited	<input type="checkbox"/>	Box No. VII	Certain defects in the international application	<input type="checkbox"/>	Box No. VIII	Certain observations on the international application
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<input type="checkbox"/>	Box No. VIII	Certain observations on the international application																						

Date of submission of the demand 7 January 2005	Date of completion of the report 10 March 2005
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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/NZ2004/000070

Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
 - ☐ This report is based on translations from the original language into the following language which is the language of a translation furnished for the purposes of:
 - ☐ international search (under Rules 12.3 and 23.1 (b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the elements of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):
 - ☐ the international application as originally filed/furnished
 - ☒ the description:
 - pages 1-19 as originally filed/furnished
 - pages* received by this Authority on with the letter of
 - pages* received by this Authority on with the letter of
 - ☒ the claims:
 - pages as originally filed/furnished
 - pages* **Claims 1-24** as amended (together with any statement) under Article 19
 - pages* received by this Authority on with the letter of
 - pages* received by this Authority on with the letter of
 - ☒ the drawings:
 - pages 1-4 as originally filed/furnished
 - pages* received by this Authority on with the letter of
 - pages* received by this Authority on with the letter of
 - ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.
3. ☐ The amendments have resulted in the cancellation of:
 - ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to the sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
 - ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to the sequence listing (*specify*):

* If item 4 applies, some or all of those sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/NZ2004/000070

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 1-24	YES
	Claims	NO
Inventive step (IS)	Claims 1-24	YES
	Claims	NO
Industrial applicability (IA)	Claims 1-24	YES
	Claims	NO

2. Citations and explanations (Rule 70.7)

Claims 1-24

The invention of the amended claims is a range sensing system. An energy source is adapted to emit energy which is capable of reflection by a target. The energy source is activated and deactivated in a cyclic pattern with a selected source frequency. A receiver is adapted to sense the reflection of emitted energy from the target. The receiver includes a shielding system to block the sensing of reflected energy from the target in a cyclic pattern with a selected receiver frequency which is different from the source frequency. The output signal of the receiver is compared with a reference signal whereby the phase difference between the receiver signal and reference signal is used to determine a range value.

No individual citation or combination of citations disclose source frequency and receiver frequencies being selected from different frequency values.

The closest art of:

US 6507706 B1

shows a range imaging system including an illumination system where same modulation frequency is used at the source and the receiver.

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WHAT WE CLAIM IS:

1. A range sensing system which includes:

at least one energy source adapted to emit energy capable of reflection by one or more targets within a region, and

at least one receiver adapted to sense the reflection of emitted energy from said at least one target within said region, and

an activation system associated with said at least one energy source, said activation system being adapted to activate and deactivate an energy source in a cycle pattern with a selected source frequency, and

a shielding system associated with said at least one receiver, said shielding system being adapted to block the sensing of reflected energy from a target by a receiver, said shielding system being activated and deactivated in a cyclic pattern with a selected receiver frequency, said source frequency and receiver frequencies being selected from different frequency values,

wherein an output signal of a receiver is compared with a reference signal to determine a range value for a selected target of the receiver, where phase differences between the receiver signal and reference signal indicate a range value.

2. A range sensing system as claimed in claim 1 adapted to indicate range values for a plurality of targets within a region.
3. A range sensing system as claimed in claim 1 or claim 2 wherein the source frequency used is phase locked with respect to the receiver frequency used.

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4. A range sensing system as claimed in claim 3 wherein a single signal generator generates a receiver frequency which is phase locked with respect to a source frequency generated by the same signal generator.
5. A range sensing system as claimed in any one of claims 2 to 4 wherein an output signal of a receiver has a frequency equal to the frequency difference between a source frequency and a receiver frequency.
6. A range sensing system as claimed in any previous claim wherein said at least one energy source is activated and said at least one receiver is shielded using a plurality of paired source and receiver frequencies.
7. A range sensing system as claimed in claim 6 wherein a receiver is adapted to emit a plurality of output signals in response to the use of said plurality of paired sets of source and received frequencies.
8. A range sensing system as claimed in any previous claim which includes a single energy source only with a diffuse emission pattern.
9. A range sensing system as claimed in any previous claim wherein an energy source is formed from a light emitting diode.
10. A range sensing system as claimed in any previous claim wherein an energy source emits visible light energy.
11. A range sensing system as claimed in claim 10 wherein a receiver is formed from a light sensitive transducer.
12. A range sensing system as claimed in claim 11 wherein the receiver is formed from or implemented by a charged coupled device.

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13. A range sensing system as claimed in any previous claim wherein the range sensing system includes a single receiver only.
14. A range sensing system as claimed in any previous claim wherein the activation system controls the supply of power to an energy source.
15. A range sensing system as claimed in any previous claim wherein the shielding system is implemented through a physical barrier.
16. A range sensing system as claimed in any one of claims 1 to 15 wherein the shielding system is implemented through an enable signal applied to operate a receiver.
17. A range sensing system as claimed in any previous claim wherein the reference signal is generated by mixing the receiver frequency and the source frequency.
18. A range sensing system as claimed in any one of claims 1 to 17 wherein the reference signal is generated through a calibration procedure.
19. A range sensing system as claimed in any previous claim wherein the range sensing system includes a processing means adapted to compare an output signal of the receiver to a reference signal.
20. A range sensing system as claimed in claim 19 wherein the processing means is a computer system.
21. A method of calculating a range to a target within a region, characterised by the steps of:
 - (i) activating an energy source using an activation system, said energy source being activated and deactivated in a cyclic pattern with a selected source

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frequency, and

- (ii) operating a receiver using a shielding system, said shielding system being adapted to block the sensing of reflected energy from a target in a cyclic pattern with a selected receiver frequency, said source frequency and receiver frequency being selected from different frequency values, and
 - (iii) comparing a receiver output signal with a reference signal to determine a range value for said target, where phase differences between the receiver output signal and reference signal indicate a range value.
22. A method of calculating a range to a target within a region as claimed in claim 21 wherein the energy source is activated and the receiver is shielded using a plurality of paired source and receiver frequencies.
23. A range sensing system substantially as herein described with reference to and as illustrated by the accompanying drawings and/or examples.
24. A method of calculating a range to a target within a region substantially as herein described with reference to and as illustrated by the accompanying drawings and/or examples.